Secure Power Ltd

User Manual

SP200 Series UPS

SP206

SP2010

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Safety

WARNING!

THIS EQUIPMENT MUST BE INSTALLED, COMMISSIONED AND MAINTAINED BY A QUALIFIED ELECTRICIAN.

There are dangerous voltages and high temperatures inside the UPS. During installation, operation and maintenance please abide by local safety instructions, regulations and laws. Failure to do so may result in injury to personnel or damage to equipment. Safety instructions in this manual are supplementary to local safety instructions. Secure Power Ltd does not accept any liability caused as a result of failure to follow safety instructions. Please note the following:

- Do not use the UPS for any other purpose than the one for which it was designed.
- Do not exceed the rated load of the UPS.
- Under no circumstances open the UPS. There are high capacity batteries inside and other electronics that can cause electric shock. If the UPS requires internal maintenance or battery replacement, contact Secure Power Ltd.
- Keep the UPS in a dry well ventilated location away from any area or situation in which there is a risk of fire, such as direct sunlight or other sources of heat.
- If the UPS emits smoke, turn off immediately the input circuit breaker and, if used, the external battery circuit breaker, and contact Secure Power Ltd.

WARNING!

THIS IS A PRODUCT FOR COMMERCIAL AND INDUSTRIAL APPLICATION IN THE SECOND ENVIRONMENT INSTALLATION RESTRICTIONS OR ADDITIONAL MEASURES MAY BE NEEDED TO PREVENT DISTURBANCES (AS STATED IN EN62040-2:2006).

Warning symbols

The safety symbols used in this manual are shown in table below. They alert you to important safety information that you need to be aware of when installing, operating and maintaining the UPS.

Safety Symbol	Indication
	Attention
	Static discharge sensitive
	Electric shock

Caution: A caution describes a situation in which there is a risk of damage to equipment.

WARNING!

A WARNING DESCRIBES A SITUATION IN WHICH THERE IS A RISK OF INJURY OR DEATH TO PERSONNEL.

Product description

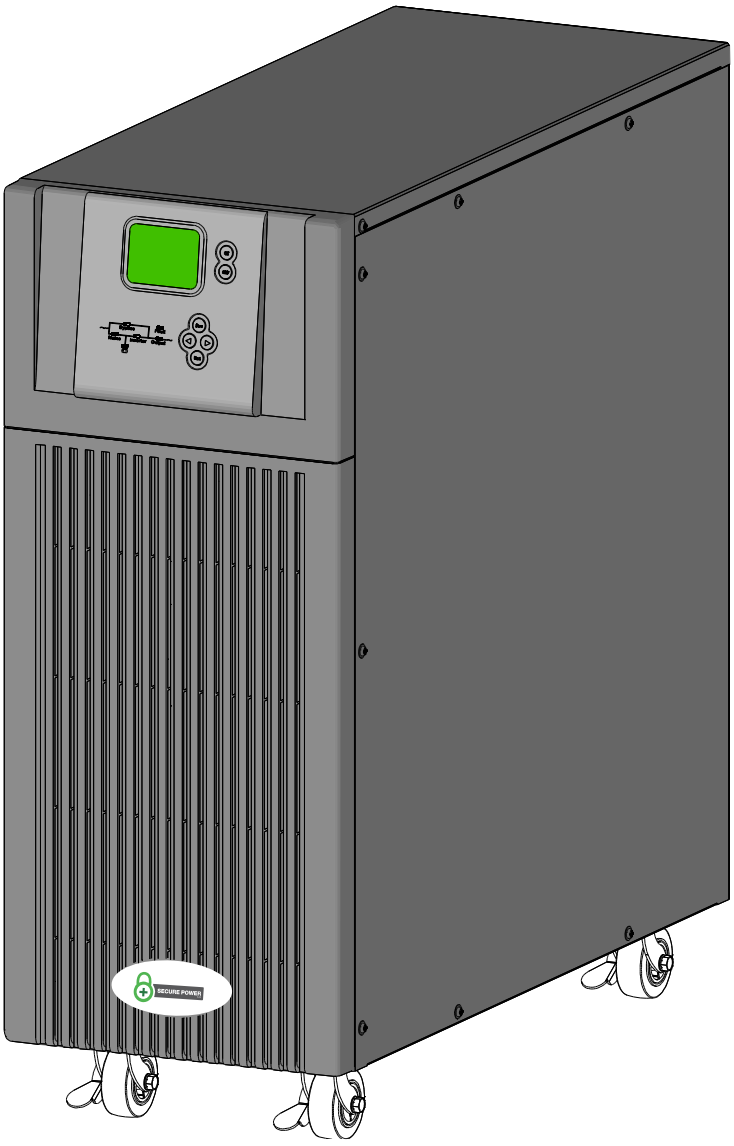
Applications

This UPS series provides reliable AC backup power to various types of equipment, for example computer centres, network management centres, auto control systems, and telecommunication systems.

Product range

The following table lists the models available in the SP200 series. Models with an E suffix are designed for operation with an external battery.

Capacity	6 kVA		10 kVA	
Model	SP206	SP206E	SP2010	SP2010E
Battery location	Internal	External	Internal	External



System block diagram

The UPS can be installed and operated as a single unit or it can be operated with other units of the same type in parallel N+1 redundant mode for additional reliability, or in a parallel capacity mode for increased output rating. To operate in parallel, units must be specified and purchased with a factory fitted parallel kit. Figure 1 is a functional block diagram representing a single UPS. In cases where it is not possible to meet the hold-up time with an internal battery, an E suffix unit with an external battery in place of the internal battery can be used.

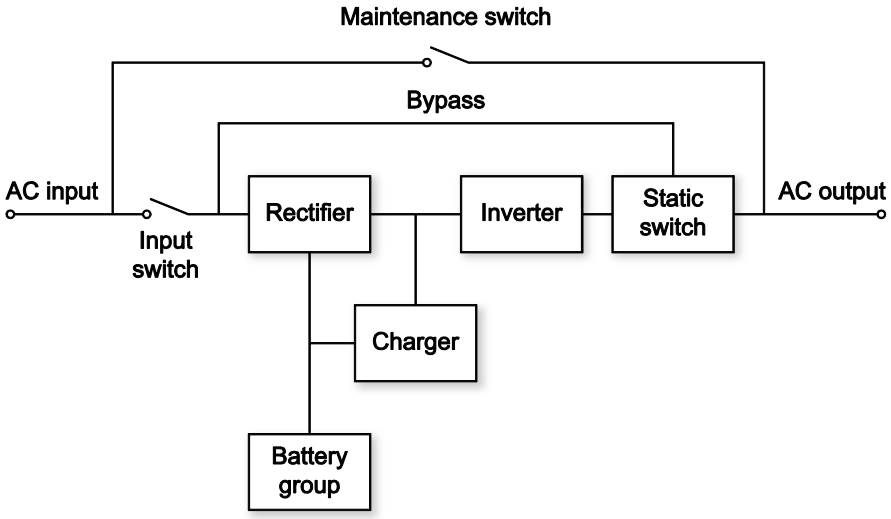


Figure 1 Single unit block diagram

Features

- SP200 series units have an intelligent online sine-wave output with power factor correction. High frequency double-conversion and a wide input voltage range ensure continuous output for areas with poor power supply regulation.
- DSP technology for digital control ensures high reliability, circuit protection and self-diagnostics in the unlikely event of a fault. Intelligent digital battery management extends battery life and ensures optimum performance.
- An LCD panel and LED indicators clearly display the system status and system parameters such as input/output voltage, frequency, load, and unit temperature.
- Network power management can be achieved by using UPS monitoring software.
- A hot-plug input/output and maintenance bypass switch assembly ensures power to the load is maintained if you need to service or repair a single unit. Where units are used in parallel an external maintenance bypass switch must be used as the built in bypass switch is only rated for the current of a single UPS.

Installation

Siting considerations

Before unpacking and installing the unit, consider the following:

- DO NOT expose the UPS to high temperatures, water ingress, flammable or corrosive gas, dust, direct sunlight or explosives.
- Locate the UPS indoors on a level surface as close as possible to the equipment it will be powering to minimise cable voltage drops. Allow enough spare cable to move the UPS and access the rear and side panels during servicing.
- Maintain a gap of at least 20 cm from walls or other equipment and ensure the ventilation holes/slots at the front and rear of the units are not obstructed.
- For maximum battery life and improved product reliability ensure cool air is available at the front of the unit. As an approximation, battery life is halved for every 10K (10°C) rise in temperature.

Wiring considerations

To ensure a safe installation please follow these instructions and the local electrical code of the area or country in which you are installing the equipment:

- If the UPS is to be supplied from a local transformer, ensure the transformer kVA rating is at least 50% greater than the UPS output kVA rating.
- Use circuit breakers and cables with the correct rating (see the next section).
- Always fit an MCB between the mains supply live line only and the UPS input (see Figure 2).

Caution: Do not fit an MCB in the neutral line.

- Because of the high leakage current, permanently hard wire all the a.c. cables or use industrial connectors (not domestic connectors).
- Use ring terminal crimps on the end of all cable conductors to ensure the connections are secure.
- If using external batteries, always fit a 3 pole MCCB, with a suitable d.c. voltage rating and breaking capacity, between the battery and the UPS (see Figure 2).

Caution: The UPS is designed to work with a centre-tap battery only.

- Although it may not be absolutely necessary, we recommend you fit an MCB between the UPS and the load to protect the output load and cables in the event of a fault (see Figure 2). You may also wish to connect the UPS output to your load via a distribution unit (PDU).

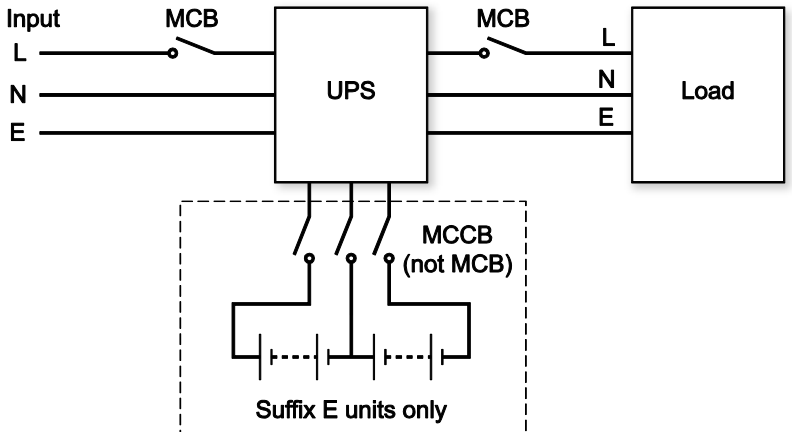


Figure 2 Power cable wiring configuration for a single UPS

User Manual

Operation from a generator

As a guide we recommend that the load capacity should be less than 30% of the generator capacity, and the generator rating should be 1.5 to 2 times the rating of the UPS, depending on the type of generator used.

Caution: Ensure that the neutral line from the generator is permanently connected to the mains neutral line. Do not use an MCB or any other type of switch in this line.

Circuit breaker and cable sizes

Use the following sizes of circuit breakers and cables to connect the UPS between mains power and the load.

Model	Battery breaker (A)	Battery breaker type	Input and output breakers (A)	Breaker type	Input, output and battery cable sizes (mm^2)
SP206	-	-	C40/C63	MCB	6 (10 AWG)
SP206E	32	MCCB			
SP2010	-	-	C63/C80	MCB	10 (8 AWG)
SP2010E	50	MCCB			

Caution: When installing suffix E units, do not use an MCB breaker in the battery line as this type of breaker is not rated for the d.c. battery voltage. Instead use an MCCB breaker that is rated for the d.c. battery voltage and the battery short-circuit current breaking capacity.

Unpacking the UPS

To unpack the UPS:

1. Cut the two straps securing the packing box to the pallet and remove the packing box by lifting it up and over the UPS.
2. Remove and retain the documentation, CD and leads from the top of the UPS.
3. Dispose of packets of desiccant correctly.
4. Move the UPS off the pallet.

WARNING!

UNITS CAN WEIGH UP TO 80 KG. TO PREVENT THE UPS FROM FALLING DO NOT LEAN IT WHEN MOVING IT OFF THE PALLET.

5. Check the appearance of the UPS to see if it is damaged. If any damage is found, do not switch on the UPS and contact the dealer.
6. Check the packing list. Contact your distributor if any of the accessories are missing.

Rear panel layout

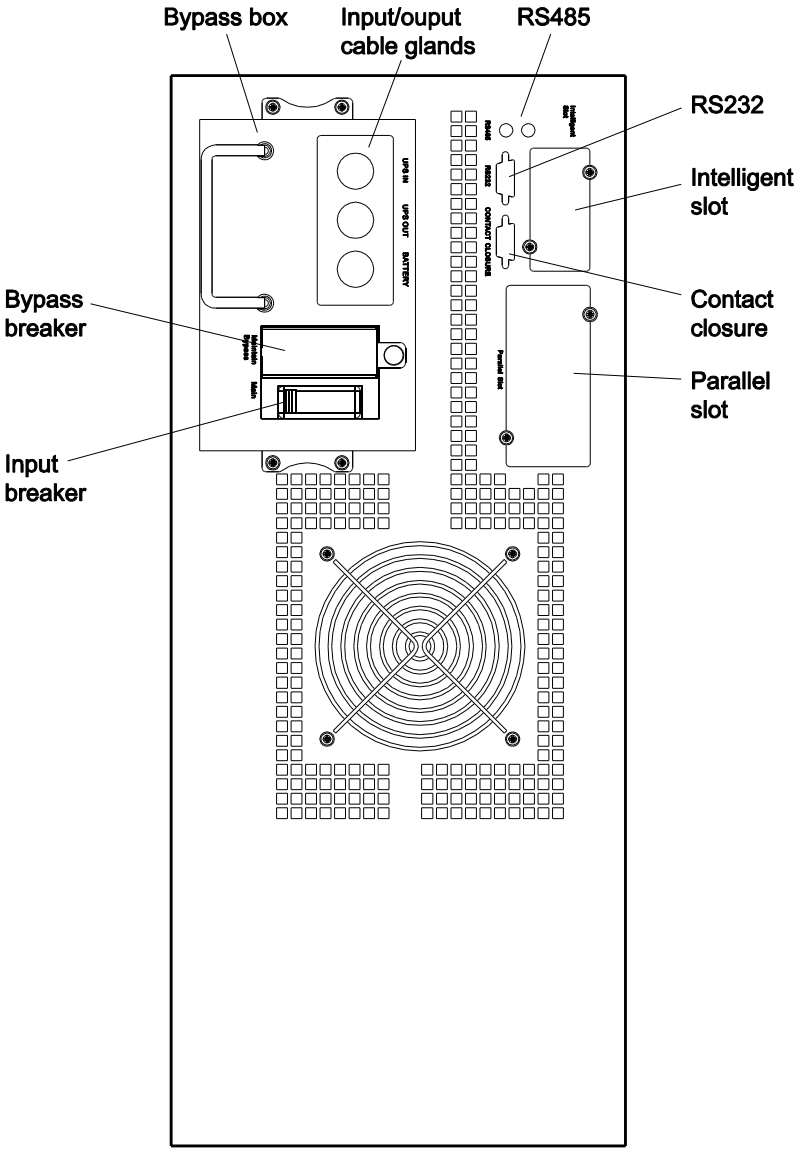


Figure 3 Rear panel layout

Wiring the UPS

Before connecting the UPS, read the siting considerations above and check you have selected breakers and cables with the correct ratings.

WARNING!

BEFORE ATTEMPTING TO WIRE THE UPS ENSURE ALL BREAKERS ARE IN THE OFF POSITION.

Caution: If your system uses external batteries, DO NOT mix batteries from different manufacturers or mix different types of batteries. DO NOT use old and new batteries together.

Note: In addition to the normal tools required for electrical installation you will need a PH2 Phillips screwdriver to remove the UPS gland box and panels. Do not use a pozidrive (PZ) screwdriver.

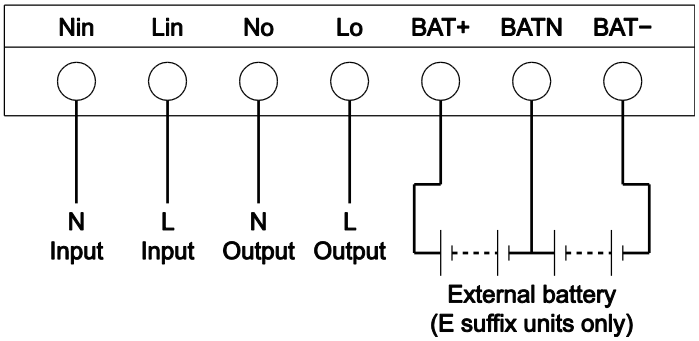
To connect the UPS to your system:

1. If your system uses external batteries:
   a. Check that the number of 12 V blocks in each string (positive and negative) is equal and matches the number specified in your order.
   b. Measure the battery voltage. The voltage should be approximately 192 Vd.c. for 16 batteries, 216 Vd.c. for 18 batteries and 240 Vd.c. for 20 batteries.
2. On the rear of the unit, remove the bypass box (4 screws).
3. Remove the gland box cover.
4. Remove the terminal cover. On suffix E units there are four screws, two of which are located inside the gland box.
5. Feed all the cables through the gland box cover.

Caution: Ring crimps are required on all wires to ensure the connections are secure.

Note: Complete steps 6 and 7 in the order shown or you won't be able to access the earth terminals.

6. Wire the input and output earth cables to the UPS bypass box terminals. Ensure that both connections are made.
7. Wire the input, output and battery cables to the UPS bypass box terminals.



WARNING!

CHECK THAT ALL CABLES ARE WIRED TO THE CORRECT TERMINALS. DO NOT REVERSE THE INPUT LIVE AND NEUTRAL CONNECTIONS OR THE POLARITY OF ANY OF THE BATTERY WIRES.

8. Refit all the covers and ensure all cable glands are fully tightened.
9. Refit the bypass box to the UPS.

10. If your unit has an SNMP or relay contact card fitted or you plan to use the RS232 port or other standard signals, see Appendix 1 Signals options on page 24.

Wiring units in parallel

You can operate 2, 3 or 4 units in parallel. Each unit must be ordered with a factory fitted parallel board option.

Caution: If you are using units with external batteries, each unit requires its own battery bank. You cannot use a common battery bank for more than one unit working in parallel mode.

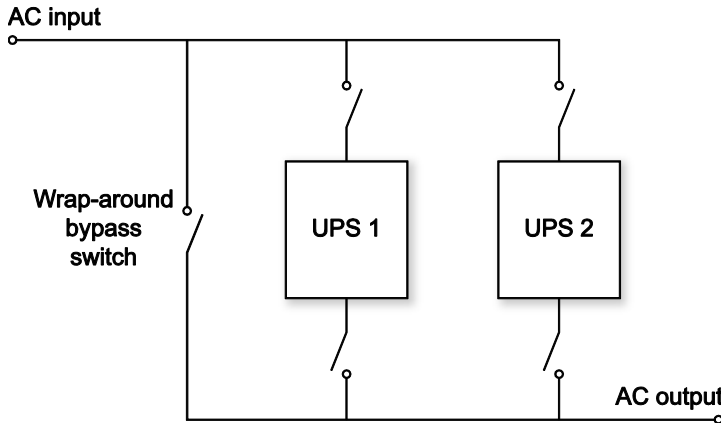
When operating units in parallel you must not use the built-in bypass as it is rated for one unit only. If you need a bypass for the parallel system it must be wired as an external item.

WARNING!

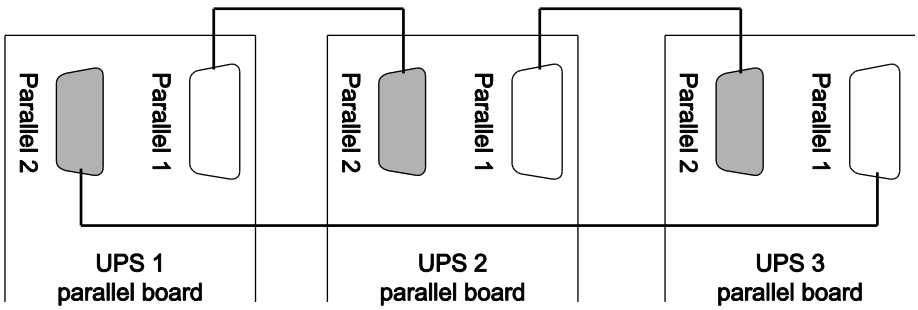
BEFORE ATTEMPTING TO WIRE THE UNITS, ENSURE ALL BREAKERS ARE IN THE OFF POSITION.

To connect two or more units in parallel:

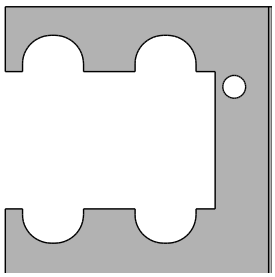
1. Wire the power cables and optional signals as described above.
2. If a system bypass is required, wire in a separate MCB capable of carrying the total system load current as shown below. This is not required if you have only two units working in N+1 mode where the load never exceed the rating of a single unit.



3. On the parallel board of each UPS, connect the CAN bus labelled **Parallel 1** and **Parallel 2**, in a ring arrangement using the supplied RS232 cables as shown below. Make sure you wire all CAN bus connectors and secure them in place using their captive screw locks.

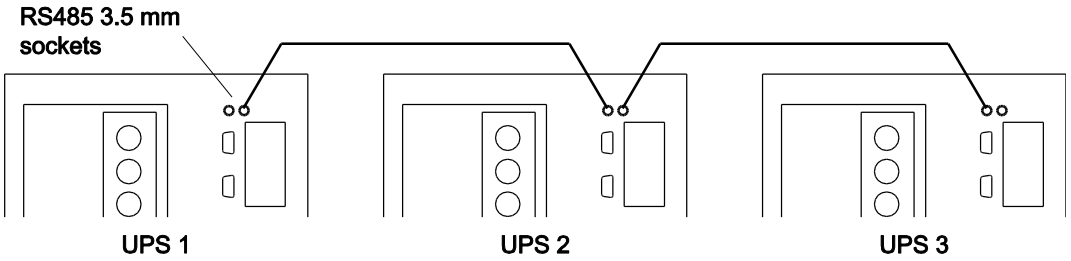


4. Locate a locking plate over each pair of connectors and secure in place. This provides extra protection against accidental removal of a CAN bus cable.



5. Optional connection. You can control and monitor all units using the RS232 port on one UPS. To do this, connect the pink RS485 socket of one unit to the green RS485 socket of the next unit and so on until all units are connected in a daisy-chain. Do not connect the units in a loop.

> **Note:** Do not confuse the RS485 sockets with the LBS sockets on the parallel cards.



Operation

Working modes

The UPS has four distinct modes of operation:

- On-line mode
- Bypass mode
- Battery mode
- ECO mode

Each operating mode is described below.

On-Line mode

This is the default mode of operation in which the load is supplied via the inverter when the a.c. input and load are within their normal ranges. The battery is trickle charged in this mode.

During fault conditions the UPS automatically switches to either bypass mode or battery mode without interruption to the load.

Bypass mode

In bypass mode the load is supplied directly from the a.c. mains input and the battery is charged. The UPS switches to bypass mode when any of the following conditions occur:

- An output overload – the unit beeps twice every second, indicating that the load must be reduced to within its normal range as soon as possible. Once the overload is removed the inverter re-starts after a 5 minute delay. If the UPS is overloaded too many times in any one hour it will eventually remain in bypass mode.
- The UPS is too hot – the UPS reverts to on-line mode as soon as the unit temperature returns to normal.
- The UPS fails – a serious fault has occurred within the UPS that must be repaired.
- The UPS is turned off.

In bypass mode the Inverter LED is off and the Bypass LED is on.

Battery mode

In battery mode the load is supplied from the battery via the inverter, the UPS beeps every 3 s, and the rectifier and charger are turned off. The UPS switches to battery mode when there is no a.c. input or the a.c. input is outside its normal range. On the front panel the Mains LED if off and the Battery LED is on.

When the battery reaches a preset low limit, the system gives a low battery voltage alarm signal, the LCD provides a low battery alarm, and the UPS beeps every second. Eventually the UPS shuts down to prevent damage to the batteries.

When the a.c. mains is restored the inverter starts automatically and the UPS reverts to on-line mode. If you turn off the UPS in battery mode it restarts in bypass mode and you must press the ON button to start the inverter.

ECO mode

If specified, your UPS may be set to operate in ECO mode instead of on-line mode. In ECO mode the load is supplied via the bypass circuit and not the inverter, allowing the UPS to work at higher efficiency. The battery is trickle charged in this mode. If the a.c. input is lost or goes beyond its normal range the UPS automatically switches to battery mode, however, the transfer speed is slower than on-line mode and may not be suitable for all applications.

Before switch on

Before turning on the unit for the first time or after any wiring or battery changes:

1. Read the section above on working modes.
2. Check all the wiring.
3. Check that the rated load does not exceed the rated output of the UPS.

> **Note:** If your installation uses a 16 or 18 block external battery string the UPS power output (kW rating) is limited to 70% of the kVA rating instead of the normal 80% (see Appendix 3 Specifications on page 29).

4. If the UPS is supplied by a generator, check that the generator is correctly rated and wired (see Operation from a generator on page 9).
5. Apply the wheel locks to prevent the UPS from moving.

Switching on the UPS

> **Note:** It is important to switch on your UPS as described below as damage may occur when supplying certain load types.

Caution: When using the UPS for the first time, charge the batteries for at least 8 hours as they may have lost charge during the time between production and installation.

To switch on your UPS:

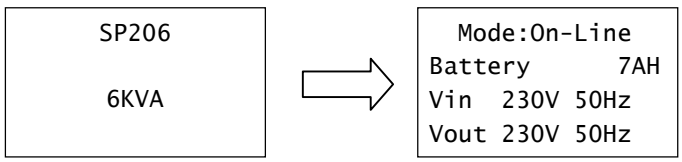
1. If your installation has an external bypass breaker, ensure it is open.
2. If your installation has an external battery, switch on the battery breaker.
3. Switch on the input breaker.
4. On the rear panel, switch on the unit main breaker.

> **Note:** If switching on into a transformer load, ensure the UPS is initially working in bypass mode before switching to on-line mode.

5. Switch on the output breaker. Ideally it is best to apply the load gradually if this is possible.

Caution: If the UPS input power is provided by a generator it is important to apply the load gradually.

You should immediately hear the fan start up. The model number and rating is initially displayed on the front panel LCD. After a few seconds this changes to system information.



At the same time that the fan starts the Bypass and Output LEDs are illuminated. After a few seconds the Mains and Inverter LEDs are illuminated and the Bypass LED goes out (see Figure 4 on page 17).

In this state your unit is working correctly and delivering power to the load. There is no need to alter any settings.

Switching off the UPS

Caution: All power to the load will be removed when you follow this procedure.

To switch off the UPS:

1. On the front panel (see Figure 4 on page 17), press **OFF** to place the unit in bypass mode.
2. When prompted by the LCD, press **Ent** to confirm your action. The Bypass LED turns on and the Inverter LED turns off.
3. On the rear panel, turn off the unit main breaker. After a few seconds the unit shuts down (the fan stops and LCD and LEDs turn off).

Swapping out a UPS on a live system

SP200 series units are fitted with a bypass box that allows you to swap a UPS without the need to do any wiring.

Note: Always use a PH2 Phillips screwdriver and not a pozidrive (PZ) screwdriver.

To exchange a UPS while maintaining the load:

1. On the front panel, press **OFF** to switch the unit to bypass mode.
2. When prompted by the LCD, press **Ent** to confirm your action. The Bypass LED turns on and the Inverter LED turns off.
3. Access the rear panel and remove the screw that holds the maintenance breaker cover in place. It is located just above the input breaker.
4. Turn on the maintenance breaker.
5. Turn off the UPS main breaker. At this point power flows into and out of the bypass box only.
6. Remove the four screws that hold the bypass box in place and extract the box from the UPS.
7. Replace the UPS.
8. Slide the bypass box into the new UPS.
9. Turn on the new UPS's main breaker.
10. Ensure that the Mains and Bypass LEDs are illuminated. This indicates that the UPS is working correctly.
11. Turn off the maintenance breaker and fasten its protective cover in place. After a few seconds the UPS automatically switches to on-line mode.

Front panel controls and indicators

The front panel controls and indicators are shown in Figure 4. Using the buttons, LEDs and the menu structure displayed on the LCD panel you can:

- Check the status of the UPS
- Check and make changes to the settings

> **Note:** Your UPS is setup to your requirements by the distributor prior to delivery. There is normally no reason to change any of the settings.

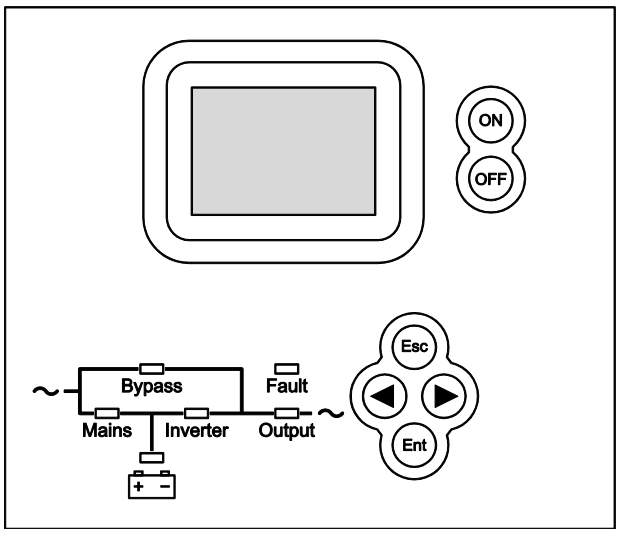


Figure 4 Front panel

The following table describes the operation of the LED indicators:

LED	Description
Output	On when the load is being supplied.
Inverter	On when the UPS is supplying power. The LED flashes when the inverter is overloaded.
Battery	On when the power is supplied from the battery. The LED flashes if the battery is low or disconnected.
Mains	On when mains in present and within limits. The LED flashes if the mains is outside its normal range.
Fault	On when there is any type of fault.

The following table describes the button functions:

Button	Definition
ON	Press and hold for 1 s to turn on the inverter when in battery mode or bypass mode.
OFF	Press and hold for 1 s to turn off the inverter and put the unit into bypass mode.
Ent	Press to confirm an operation or enter a lower menu level.
Esc	Press to cancel an operation or return to the previous menu level.
◄	Press to select another menu item or change a parameter.
►	Press to select another menu item or change a parameter.

Navigating the system menu

To access a menu item:

1. Press ◄ or ► until the following list is displayed:

```
Figure
Status
Setting
Command
```

2. Press **Ent**. An arrow (↵) appears next to **Figure**. The arrow must be next to the menu item you wish to enter.
3. Press ◄ or ► to move the arrow up or down the list to the menu item you wish to enter.
4. Press **Ent**.

You can then use the ◄, ► and **Ent** buttons in a similar way to navigate to the various sub-menus and make changes if necessary. To return to the previous menu level, press **ESC**.

The following sections show the full menu structure for each of the four main menu items listed above.

Note: The values shown below are examples only. The values in your system are likely to be different.

Figure menu items

These menu items provide UPS operating information only.

```
Figure
Mains
230.0V      0.0A
50.0Hz
```

```
Figure
Output
230.0V      0.0A
50.0Hz   Load:0%
```

```
Figure
Output
   0KW  PAK:   0
   0KVA
```

```
Figure
Invert
230.0V
50.0Hz
```

```
Figure
PBatt Charge
111.1V      0.4A
```

```
Figure
NBatt Charge
111.1V      0.4A
```

```
Figure
Bus
-390V      +390V
```

```
Figure
Temperature   ˚C
Inner: 20
REC: 20  INV: 20
```

Status menu items

These menu items provide UPS system information only. There are five sub-menu items as shown below:

```
Status
State
Alarm & Fault
Rated POWER
```

```
Status
Rate POWER
Code
Version
```

State information

```
Status
State
CurState: Mains
SWMB OFF
```

```
Status
State
Inverter ON
Battery Charging
```

```
Status
State
Battery Charging
Battery Boost
```

Alarm and Fault info.

```
Status
Alarm & Fault
```

Rate Power information

```
Status
Rate POWER
MachInfo: 0101
Rate:       6KVA
```

Code information

```
Status
Code/Status
01          0x00
02       0x000000
```

```
Status
Code/AAlarm
03        0x0000
          0x0000
```

```
Status
Code/BAlarm
04        0x0000
          0x0000
```

```
Status
Code/CAlarm
05        0x0000
          0x0000
```

Version information

```
Status
Version
LCD Ver:D000B001
DSP Ver:D000B001
```

Setting menu items

These menu items allow you to change the UPS settings.

Note: We strongly recommend that you don't alter any of these settings. However, you may wish to alter the display backlight timeout and brightness using the **User set** sub-menu. If you suspect someone has accidently made some changes, compare the values in each of the sub-menus with the *Equipment Setup Sheet* provided with your UPS.

There are five sub-menu items as shown below:

```
Setting
 User     set
 System   set
 Parallel set
```

```
Setting
 Battery  set
 Revise   set
```

User set menu items

```
Setting
 User     set
▶BL.         ON
 Backlight    5
```

System set menu items

```
Setting
 System   set
▶V-Level   220V
 F-Level   50Hz
```

```
Setting
 System   set
▶Auto    Enable
 F-Range     5%
```

```
Setting
 System   set
▶V-Upper    15%
 V-Lower   -45%
```

```
Setting
 System   set
▶V-Fine      0%
 SWTimes      9
```

```
Setting
 System   set
▶Mode    On-Line
 Power   Enable
```

```
Setting
 System   set
▶Output  Enable
 Buzzer  Enable
```

Parallel set menu items

```
Setting
 Parallel set
▶ID            1
 P-Amount      1
```

```
Setting
 Parallel set
▶P-Redund      0
 LBS       No LBS
```

Battery set menu items

```
Setting
 Battery  set
►EOD        1.60
 Batt Num     16
```

```
Setting
 Battery  set
►Batt-G        1
 Batt-C        7
```

```
Setting
 Battery  set
►Boost      2.30
 Float      2.20
```

```
Setting
 Battery  set
►Boost    Enable
```

Revise set menu items

Caution: Do not adjust these menu items as they change the calibration of the UPS.

```
Setting
 Revise   set
►VRevise    4096
 InvRevise  4096
```

```
Setting
 Revise   set
►VoutRevise 4096
 +BusRevise 4096
```

```
Setting
 Revise   set
►-BusRevise 4096
 PBatRevise 4096
```

```
Setting
 Revise   set
►NBatRevise 4096
```

Command menu items

These menu items allow you to perform a battery test for a user defined period and to set the Turn on / Turn off delay time. In the Command menu there are two sub-menu items as shown below:

```
Command
►Battery Test
 Turn On Delay
```

The second command toggles between ‘Turn On Delay’ and ‘Turn Off Delay’ and so you may see either command. displayed.

Battery test menu items

```
Command
For:  ►    1 sec
Ent: sure
Esc: cancel
```

```
Command
STOP Testing
Ent: sure
Esc: cancel
```

Turn on / turn off delay menu item

```
Command
After:  ►  1 sec
Ent: sure
Esc: cancel
```

LCD display messages

Display	Meaning
CurState: Init	Initialisation
No-Out	No output
Bypass	UPS in bypass mode
Mains	Rectifier working
Battery	Battery invert
Testing	Battery test in progress
Startin	Starting
CurState: ECO	UPS running in ECO power saving mode
CurState: EPO	Emergency Power OFF mode
CurState: M-Byp	UPS in maintenance bypass mode
CurState: Fault	UPS fault
Battery Charging	Battery float charging
Battery Boost	Battery boost charging
Invter ON/ Invter OFF	Inverter working or not
Inver Master	Master of multi UPS system
SWMB ON/ SWMB OFF	Maintenance switch close or open

Maintenance

Fan

At normal room ambient temperature the fans will operate continuously for 20,000 to 40,000 hours. Increased ambient temperatures will shorten this lifetime.

Periodically ensure that there is air is blowing out of the rear of the unit.

Battery

For units with external batteries we recommend the use of sealed lead acid, maintenance free batteries. Units with internal batteries are fitted with this same type of battery. Battery life depends on the ambient temperature and the number of discharge/charge cycles. Battery life is shortened with high ambient temperature and deep discharges.

To maximise the life of your batteries, maintain them as follows:

- Maintain the ambient temperature in the range 15 to 25°C
- Avoid discharge currents of less than 10% of full load current.
- Do not operate the UPS in battery mode continuously for more than the specified autonomy (hold-up time).
- Charge the battery for at least 12 hours every 3 months if it has not been used. If the ambient temperature is higher than 25°C, charge the battery every 2 months.
- Maintain external batteries at least once a year.

If the backup time has significantly reduced, or a battery fault is displayed on the LCD screen contact your distributor to find out if the batteries need replacing.

WARNING

DON'T SHORT CIRCUIT THE BATTERY AS IT CAN CAUSE A FIRE.

DON’T OPEN THE BATTERY AS THE ELECTROLYTE INSIDE IS HARMFUL TO SKIN AND EYES.

External battery change

Caution: We strongly recommend you switch off the whole UPS when you need to change an external battery group.

Visual check

Ensure there is adequate ventilation to maintain the UPS at the correct temperature.

UPS status check

Check the following:

- Ensure there are no faults or alarms indicated.
- If the UPS is working in bypass mode, investigate the cause.
- If the UPS is working in battery mode, make sure it is normal, if not, investigate.

Function check

Perform the following function checking every 6 months:

1. Press the OFF button to ensure the buzzer, indicators and LCD are operating normally.

2. Press the ON button. Check the indicators, LCD and UPS inverter, and ensure they are working normally.
3. When the UPS is working in on-line mode, perform a battery test (see Command menu items on page 20).

Troubleshooting

Before contacting your distributor, try to solve your problem using the information in the following table. If you need to contact your distributor make sure you have the model number and serial number of your UPS.

No	Problem description	Probable causes	Solution
1	LCD off and no self diagnosis	a. Input power absent b. Low input	Use a multimeter to check whether the input voltage is normal.
2	AC normal but AC indicator off, UPS is in battery mode	a. Input circuit breaker off b. Input power connection problem	a. Switch on input breaker b. Check the connection and redo
3	No alarm but no output	Output connection problem	Check the connection and redo
4	UPS doesn't start after pressing ON button	a. ON button press too short b. Overload	a. Press and hold ON button for 1s b. Disconnect all loads and restart
5	AC indicator flashing	Input AC is beyond normal range	Monitor the backup time if the UPS is in battery mode
6	Buzzer beeps twice every second, LCD displays 'output overload'	UPS overload	Reduce the load on the UPS
7	Fault indicator on, LCD displays 'battery fault'	a. Battery circuit breaker off or poor connection b. Reverse battery connection c. Battery defective	a. Switch on the breaker, check the battery connections b. Check the battery polarity c. Contact distributor to replace battery
8	Fault indicator on, LCD displays 'charger fault'	Charger defective	Contact distributor
9	Abnormal backup time	a. Battery not fully charged b. Battery defective	a. Charge battery for 8 hours when AC is normal, then re-test the backup time b. Contact distributor to replace battery
10	Long beeps fault indicator on and UPS switches to bypass mode	UPS is too hot	a. In the status menu, check for an over temperature warning b. Check that there is airflow from the fans c. Ensure there are no airflow blockages d. Wait until the UPS has cooled down and try to restart it
11	Long beep fault indicator on, LCD displays 'output short circuit'	Output short circuit	Remove the short circuit and restart the UPS
12	Long beeps fault indicator on, LCD displays 'rectifier fault'/'inverter fault'/'auxiliary power fault'/'output fault'	Fault inside UPS	Contact distributor
13	Abnormal sound or smell	Fault inside UPS	Shut down UPS immediately and contact distributor

Appendix 1 Signals options

RS232 serial port

SP200 series units are fitted with a standard RS232 serial port, which can be used to:

- Monitor the UPS power status
- Monitor the UPS alarm information
- Monitor the UPS running parameters
- Perform a battery test

To enable RS232 control:

1. Connect the UPS to your computer using the supplied RS232 cable.
2. Load the supplied software onto your computer.

Connections between computer and UPS RS232 ports

Computer		UPS
RDX 2	←	TX 3
TDX 3	→	RX 2
GND 5		GND 5

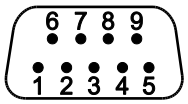


Figure 5 RS232 serial port pin-outs looking at the socket on the UPS

RS232 communication data format

Parameter	Value
Baud rate	2400 bps
Byte length	8bit
End bit	1bit
Parity check	Null

Contact closure (basic monitoring and control)

SP200 series units are fitted with a standard DB9 socket on the rear panel (labelled 'Contact Closure'). The connector provides access to a set of dry contacts giving you basic monitoring and control functionality. The signal connections are as follows:

Pin number	Function
1	battery low signal
2	signal common (0 V)
4	a.c. fail signal
9	turn off signal (apply +5 V to +12 Vd.c. for 2 s)

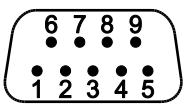


Figure 6 DB9 socket pin-outs looking at the socket on the UPS

SNMP card (advanced monitoring and control)

If your unit is fitted with the optional SNMP card (located in the Intelligent Slot on the rear panel), connect it to your computer with a network cable (see Figure 7).

For instruction on how to operate the SNMP card, refer to the documentation on the supplied CD.

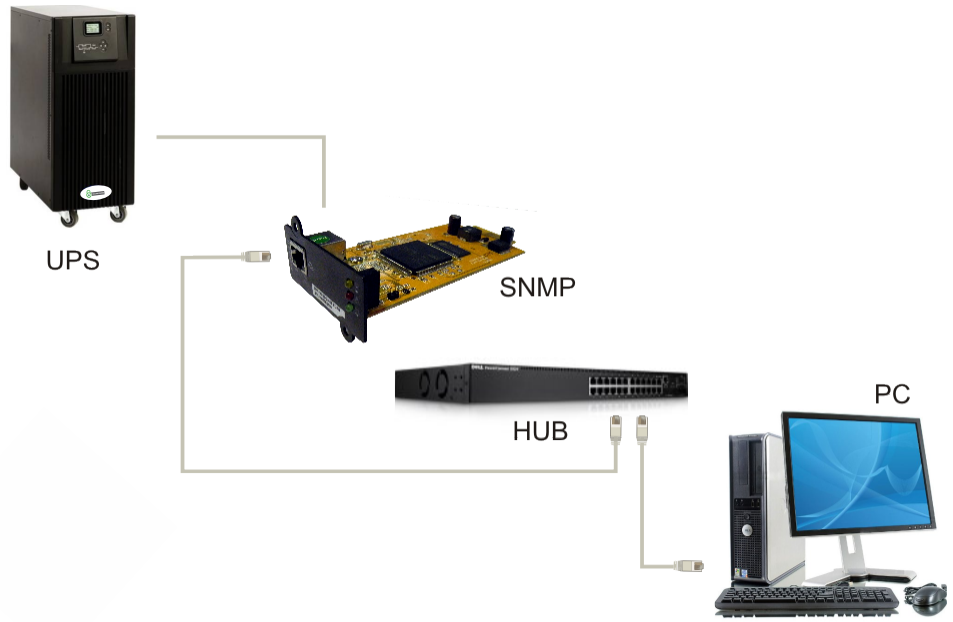


Figure 7 Typical network connections

Relay card (advanced monitoring and control)

If your unit has been specified and fitted with the optional relay card (located in the Intelligent Slot on the rear panel) you have access to more advanced monitoring and control functionality via a set of dry contacts and a single opto-coupled input.

Connections:

Pin no.	Description	Contact status	Additional fault information
1	Mains out of limits	closed (on)	
2	Battery low	open (off)	
3	Battery low	closed (on)	
4	Bypass output	closed (on)	
5	Internal failure	closed (on)	• Rectifier fault • inverter fault and shutdown • over temperature and shutdown • short circuit and shutdown
6	Inverter output	closed (on)	
7	System alarm	closed (on)	• Rectifier fault • inverter fault and shutdown • over temperature and shutdown • short circuit and shutdown
8	Relay common GND		
9	Remote shutdown	+V (see opto specification below)	

10	Remote shutdown	0 V (not the same as relay common)	

Relay contact specifications:

Parameter	Value
Maximum switched voltage	277 Va.c. or 30 Vd.c.
Typical switched voltage	5 to 12 Vd.c.
Maximum switched current	NO: 10 A NC: 3 A
Maximum switched power	NO: 1400 VA, 150 W NC: 850 VA, 90 W

Opto-coupler input specifications (used for remote shutdown):

Parameter	Value
Reverse voltage (V_R)	5 Vd.c.
Forward input voltage	30 Vd.c. max., 5 to 12 Vd.c. typical
Forward current	25 mA max., 16 mA typical
Pulse forward current (I_{FP})	1 A (100 µs pulse, 100 pps)

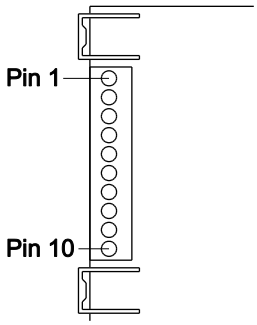


Figure 8 Relay card connector (viewed from connector side)

To connect to the relay card:

1. On the rear of the UPS, unscrew the card and slide it out completely or sufficient to access the terminal block.
2. Using the information in the tables above, wire your signal cables to the terminal block (Figure 8).
3. Refit the card and secure it in place with the cover plate.

Appendix 2 Parallel board signals

The parallel board has three sets of signals:

- CAN bus (DB9) connectors. These must be connected as described in Wiring units in parallel on page 12.
- LBS (Load Bus Synchronisation) connectors. These may be used for a particular system configuration as described below.
- Optional dry contact relay signals described below.

LBS (Load Bus Synchronisation)

It is possible to synchronise the output of two separate paralleled systems, where each system can consist of up to 4 paralleled units. It is only necessary to connect UPS number 1 of each system.

To do this, connect the LBS1 (pink) connector of system A to the LBS2 (green) connector of system B. The LBS connectors are 3.5 mm 3-pole jack sockets.

Dry contact relay signals

To wire to the signals you will need:

- A Molex connector, part no. 39-01-2120 (94V-2) or 39-01-2125 (94V-0).
- Crimps (part no. 39-00-0039)

As an option you may want to fit a strain relief, part no. 15-04-0345 (94V-2).

Connections:

Pin no.	Signal name	Description
1	12V	Provides a +12 V 100 mA isolated supply
2	GND	Common return (0 V) for the +12 V supply and relays. This is not connected to the chassis.
3	Remote ON	Connect to +12V to turn on the UPS (pulse contact)
4	Remote OFF	Connect to +12V to turn off the UPS (pulse contact)
5	EPO	Emergency power off connect to +12V for complete power off (pulse contact)
6	BAT_T4	Over temperature switch on battery 4. Feed +12 V via the switch when the battery temperature is exceeded.
7	BAT_T1	Over temperature switch on battery 1. Feed +12 V via the switch when the battery temperature is exceeded.
8	BAT_T2	Over temperature switch on battery 2. Feed +12 V via the switch when the battery temperature is exceeded.
9	BP-C	Anti-backfeed relay common
10	BP-O	Anti-backfeed relay normally closed. To prevent the input being energised by backfeeding in the event of an internal failure, connect this signal to an external circuit breaker trip.
11	BP-S	Anti-backfeed relay normally open. To prevent the input being energised by backfeeding in the event of an internal failure, connect this signal to an external circuit breaker trip.
12	BAT_T3	Over temperature switch on battery 3. Feed +12 V via the switch when the battery temperature is exceeded.

Appendix 3 Specifications

Electrical

Model	SP206(E)	SP2010(E)
Capacity (Int. battery or 20 cell external battery)	6 kVA, 4.8 kW, 0.8 pf	10 kVA, 8 kW, 0.8 pf
Capacity (16 or 18 cell external battery)	6 kVA, 4.2 kW, 0.7 pf	10 kVA, 7 kW, 0.7 pf

Input	
Power factor	≥0.99
Rated voltage (nominal)	220 Va.c. or 230 Va.c.
Rated frequency	50 Hz or 60 Hz
Voltage range	145 to 280 Va.c.
Maximum input voltage	320 Va.c., 1 h
Frequency range	40 to 70 Hz
Bypass voltage range	max: +5%, +10% or +15%, default +5% min: -20%, -30% or -45%, default -45%
Bypass frequency range	±1%, ±2%, ±4%, ±5%, ±10%
THDI	5% (100% linear load, input THDV ≤1%) 5% (100% non-linear load, input THDV ≤1%)

Battery	
Number of 12 V batteries	16, 18 or 20 batteries in series, centre tapped
Battery type	VRLA
Charge model	Boost charge or float charge auto switch
Charge time	Boost charge up to 20 h (max)
Charge current (A)	6 kVA: 1 A (S) / 6 A (H) 10 kVA: 1 A (S) / 6 A (H)

Output	
Output type	Single phase (L, N and E)
Output precision	1.0%
Voltage distortion (THD)	<2% with 100% linear load <3.5% with 100% non-linear load
Rated voltage	220 Va.c. / 230 Va.c.
Frequency precision	±0.1%
Frequency	50 Hz / 60 Hz
Frequency tracking speed	1 Hz/s

Output	
Overload	105% to 110%, 1 h 110% to 125%, 10 min 125% to 150%, 1 min ≥150%, 200 ms
Overload for bypass	125%
Crest factor	3:1
Efficiency in normal mode	6 kVA, ≥88%: 10 kVA, ≥90%
Efficiency in battery mode	6 kVA, ≥85%: 10 kVA, ≥81%
Efficiency of inverter	6 kVA, ≥90%: 10 kVA, ≥92%
Dynamic response	5.0%, 20 ms
DC component	≤500 mV

Switch time	
Between normal mode and battery mode	0 ms
Between inverter and bypass	0 ms unlock: <15 ms (50 Hz), <13.33 ms (60 Hz)

Parallel operation	
Parallel equal current	1+1 ≤8%，N+1 ≤10%

Safety and EMC	
Safety	IEC62040-1 GB4943
Isolation resistance	>2 MΩ (500 Vd.c.)
Isolation voltage	2,820 Vd.c., <3.5mA 1 min
EMC	Conduction: IEC 62040-2
	Radiation: IEC 62040-2
	Harmonic: IEC 62040-2
EMS	IEC 62040-2
Surge	IEC60664-1 1.2/50 μs + 8/20 μs 6 kV/3 kA

Reliability	
MTBF	250,000 h; 1+1 400,000 h
MTTR	30 min

Mechanical

Height (mm)	655
Width (mm)	250
Depth (mm)	590
Net weight	SP206: 70 kg SP206E: 30 kg SP2010: 80 kg SP2010E: 40 kg
Audible noise	<55dB (1m)
Colour	Black
Display	LCD and LED
Ingress protection	IP20

Appendix 4 Optional equipment

The following items are available as options for the UPS:

- Extended battery box
- Dry contact card
- SNMP card
- Parallel card (factory fitted only)
- Battery MCCB box
- Bypass panel

Appendix 5 UPS alarm tables

01: (Running)

0x01	No output
0x02	On bypass
0x03	Online
0x04	On battery
0x05	Battery self-testing
0x06	Inverter starting
0x07	ECO mode
0x08	EPO
0x09	Maintenance bypass
0x0A	Fault

02: (Status)

							8	9	A	B	C	D	E	F	EPO
			4	5	6	7					C	D	E	F	Rectifier working
	2	3			6	7			A	B	C		E	F	Rectifier limit
1		3		5		7		9		B		D		F	Input normal

							8	9	A	B	C	D	E	F	Input 1: main /0: battery
			4	5	6	7					C	D	E	F	Charging
	2	3			6	7			A	B	C		E	F	P-battery boost charging
1		3		5		7		9		B		D		F	N-battery boost charging

							8	9	A	B	C	D	E	F	Battery self-testing
			4	5	6	7					C	D	E	F	00: shutdown; 01: soft start; 10: no output; 11: output normal
	2	3			6	7			A	B	C		E	F	
1		3		5		7		9		B		D		F	Alarm for switch delay

							8	9	A	B	C	D	E	F	Capacity not enough
			4	5	6	7					C	D	E	F	Overload to shutdown
	2	3			6	7			A	B	C		E	F	Overload to bypass
1		3		5		7		9		B		D		F	Parallel to bypass

							8	9	A	B	C	D	E	F	Switch times up to limit
			4	5	6	7					C	D	E	F	Master
	2	3			6	7			A	B	C		E	F	MB switch closed
1		3		5		7		9		B		D		F	Input switch closed

							8	9	A	B	C	D	E	F	00: no out; 01: bypass; 10: inverter
			4	5	6	7					C	D	E	F	
	2	3			6	7			A	B	C		E	F	0 (hold)
1		3		5		7		9		B		D		F	0 (hold)

03: (Alarm A)

							8	9	A	B	C	D	E	F	Rectifier fault
			4	5	6	7					C	D	E	F	Rectifier over temperature
	2	3			6	7			A	B	C		E	F	Inverter over temperature
1		3		5		7		9		B		D		F	Rectifier over current

							8	9	A	B	C	D	E	F	Assistant supply 1 fault
			4	5	6	7					C	D	E	F	Assistant supply 2 fault
	2	3			6	7			A	B	C		E	F	Input SCR fault
1		3		5		7		9		B		D		F	Discharge SCR fault

							8	9	A	B	C	D	E	F	Charge SCR fault
			4	5	6	7					C	D	E	F	Fan fault
	2	3			6	7			A	B	C		E	F	Fan supply fault
1		3		5		7		9		B		D		F	BUS over voltage

							8	9	A	B	C	D	E	F	BUS lower voltage
			4	5	6	7					C	D	E	F	BUS voltage of P-N different
	2	3			6	7			A	B	C		E	F	Phases wrong
1		3		5		7		9		B		D		F	Soft start fault

							8	9	A	B	C	D	E	F	N loss
			4	5	6	7					C	D	E	F	Battery on the contrary
	2	3			6	7			A	B	C		E	F	No battery
1		3		5		7		9		B		D		F	P-charge fault

							8	9	A	B	C	D	E	F	N-charge fault
			4	5	6	7					C	D	E	F	Battery voltage lower
	2	3			6	7			A	B	C		E	F	Battery voltage higher
1		3		5		7		9		B		D		F	Pre-alert for battery low

							8	9	A	B	C	D	E	F	Input frequency over limit
			4	5	6	7					C	D	E	F	Input voltage over limit
	2	3			6	7			A	B	C		E	F	0 (hold)
1		3		5		7		9		B		D		F	0 (hold)

04: (Alarm B)

							8	9	A	B	C	D	E	F	Inverter fault
			4	5	6	7					C	D	E	F	Bridge cross of inverter
	2	3			6	7			A	B	C		E	F	Invert SCR short circuit
1		3		5		7		9		B		D		F	Invert SCR open circuit

							8	9	A	B	C	D	E	F	Bypass SCR short circuit
			4	5	6	7					C	D	E	F	Bypass SCR open circuit
	2	3			6	7			A	B	C		E	F	CAN communication fault
1		3		5		7		9		B		D		F	Parallel current not equal

							8	9	A	B	C	D	E	F	Bypass phase wrong
			4	5	6	7					C	D	E	F	Sync fault
	2	3			6	7			A	B	C		E	F	Bypass over track
1		3		5		7		9		B		D		F	Bypass over protect

							8	9	A	B	C	D	E	F	IGBT over current
			4	5	6	7					C	D	E	F	Fuse fault
	2	3			6	7			A	B	C		E	F	Parallel cable fault
1		3		5		7		9		B		D		F	Parallel relay fault

							8	9	A	B	C	D	E	F	LBS unlook
			4	5	6	7					C	D	E	F	Initialization fault
	2	3			6	7			A	B	C		E	F	Can’t start
1		3		5		7		9		B		D		F	Overload

							8	9	A	B	C	D	E	F	Parallel overload
			4	5	6	7					C	D	E	F	DC component over limit
	2	3			6	7			A	B	C		E	F	Bypass over current
1		3		5		7		9		B		D		F	Feedback protect